In Fig. 6 is shown the Wehnelt interrupter. A large rectangular glass vessel containing dilute sulphuric acid is fitted with an ebonite cover, E C, which supports the electrodes. The terminal T_2 is in connection with the lead plate, L P, which forms the kathode. The bridge-piece, B, supports two rack rods, R, and the anode terminal T_1. Each rack rod is geared with a pinion by means of which it may be raised or lowered as required, M H being the milled heads for turning the pinions. The rack rods are continued downwards in the form of thinner rods encircled by glass tubes, G T, and finally end in stiff platinum points, P P, around which the tapered ends of the tubes fit very closely. By raising or lowering either anode, a smaller or greater surface of it may be exposed to the surrounding electrolyte. The density of the acid depends on the voltage at which the interrupter is to be supplied. The interrupter is connected in series with the primary of the induction coil, and, if necessary, with an additional self-inductance. As soon as the circuit is closed, and provided the area of anode surface exposed to the electrolyte is not excessive, and the self-inductance not too small, the interrupter begins to act. A pink glow appears around the extremities of the anodes, the interrupter emits a loud note of definite pitch, and a shower of sparks is produced across the space between the secondary terminals of the coil. Bubbles of gas rush up each glass tube, G T, the electrolyte rises in each tube, and may overflow through the side openings, O.

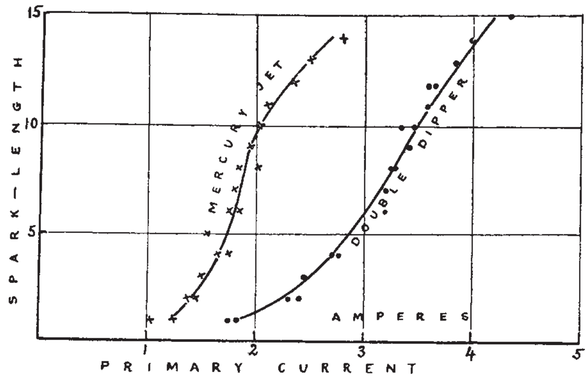

Fig. 4.

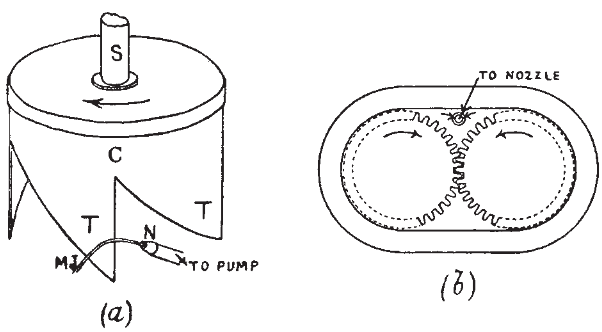

Fig. 5.

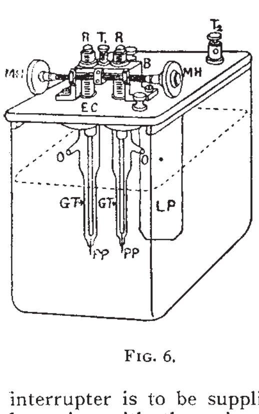

Fig. 6.

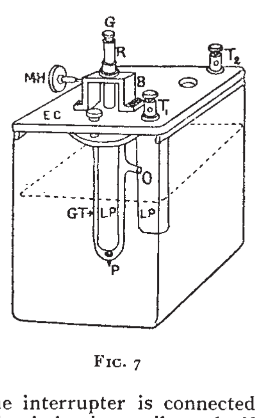

Fig. 7

Another form of electrolytic interrupter, originally due to Caldwell, but subsequently improved and modified in various ways by others, is shown in Fig. 7. The terminal T_2 is, as in the Wehnelt interrupter, connected to a lead plate. But instead of a platinum anode, a lead plate is also used for the other electrode. This second lead plate is surrounded by a glass tube, G T, which completely separates it from the remainder of the electrolyte except for a small perforation at the bottom of the tube, through which passes the pointed end, P, of a long glass rod, G, supported in a tubular rack rod, R, which may be raised or lowered by means of a pinion fitted with the milled head, M H. The area of communication between the electrolyte in the tube and that outside is controlled by raising or lowering the conical glass plug. Either electrode may be used indifferently as anode or kathode. The break takes place at the perforation of the glass tube.

In conclusion, thanks must be expressed to Mr. A. C. Cossor, of 54 Farringdon Road, E.C., who very kindly provided an induction coil and a number of interrupters required to carry out the tests recorded in this article.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

It is stated that Sir William MacDonald, of Montreal, has decided to give 800,000*l.* toward the erection of a normal school at St. Anne de Bellevue, a few miles distant from Montreal, and the erection and endowment of an agricultural college at the same place.

There is no sign of diminution in the interest shown by public authorities and by private benefactors for higher education in the United States. We learn from *Science* that by the will of Mrs. Stanford about 400,000*l.* is bequeathed to Leland Stanford Junior University. The university also comes into possession of the house built by Senator Stanford at San Francisco and its contents, which are valued at more than 400,000*l.* The legislature of North Carolina has appropriated 10,000*l.* for the erection of a chemical laboratory at the University of North Carolina.

We have received a copy of the prospectus of courses of instruction in poultry-keeping held at University College, Reading, and the college poultry farm at Theale. The farm, which is of about 40 acres, largely meadow land, is used also as an experimental station. The courses are of varying lengths and different degrees of difficulty to meet the requirements of all grades of students. The practical work is exhaustive, and due attention is given to kindred technical subjects such as carpentry. It appears that this branch of the work of the college has had an important influence on the development of scientific poultry-keeping in Berkshire and neighbouring counties.

A strong committee has been formed for the purpose of securing suitable conditions of work, and providing opportunities for development, of Bedford College for Women in London. An appeal to the public on behalf of the college has just been issued. The college, which is a school of the University of London, must before long come to an end unless it can obtain a large amount of public support. A freehold site and a new building are essential, and it is estimated that their cost may amount to 150,000*l.* Experience has shown that the fees of the students and the allotted share of the Treasury grant to university colleges are not sufficient without considerable additional support to carry on the higher education supplied by the college, the cost of which is constantly increasing. To make the work of the college fully effective, it is therefore desirable to obtain further endowment to the extent of 100,000*l.*, or the equivalent income. The Senate of the University of London has shown approbation of the scheme for re-

housing and endowing the college by passing the following resolution:—"That the authorities of Bedford College in issuing an appeal for funds in accordance with the scheme submitted to the Senate be permitted to state that the appeal is made with the knowledge and full approval of the Senate." The Princess of Wales has promised a donation to the funds, and Lady Tate has promised 10,000*l.* for a library to be called after the late Sir Henry Tate. Donations to the fund may be sent to Major Darwin, hon. treasurer of the college, or to Miss Henrietta Busk, hon secretary of the appeal fund, at Bedford College, Baker Street, W. Friends of higher education for women are urged to help in placing the college on an adequate and permanent basis.

Mr. Arnold-Forster, M.P., Secretary of State for War, distributed the prizes to successful students of the Woolwich Polytechnic on Saturday last. In his speech which followed the presentation of the prizes Mr. Arnold-Forster emphasised the importance of sound scientific and technical education. He said that the great lesson this country has to learn is the importance of scientific organisation. There was a time, not so long ago, when we were in the habit of laughing at the methods and ways in vogue on the Continent, and of considering ourselves immeasurably superior to Germany and other nations. But a change has taken place, and these other nations—not by following our example, but by organising on scientific lines—have become immeasurably more advanced and fit to succeed than those who preceded them one or two generations ago; and we have to exert ourselves to protect ourselves from defeat in the industrial contest. Referring to the importance of scientific organisation, Mr. Arnold-Forster spoke of an instance in which he discovered that the electric carbons in use by the Admiralty were largely manufactured in France. Realising the importance of this in case of war, he made inquiries, and, as the result of these and of experiment, it has been found possible to produce electric carbons in this country of the same perfection and accuracy as those formerly brought in from abroad. He expressed his pleasure that a great step forward has been made in the matter of standardising and testing, and that in both these departments this country is abreast of the times. A good deal could be done by scientific organisation, and he looked to such institutions as the polytechnics to accomplish much in that direction.

The address delivered by Prof. Henry T. Bovey, F.R.S., at the Universal Exposition, St. Louis, 1904, on the fundamental conceptions which enter into technology, has been reprinted as a pamphlet from the *McGill University Magazine.* After defining the "technologue" as an intermediary between the savant and the mechanic, translating the discoveries of the former into the uses of the latter, Prof. Bovey tries to ascertain the controlling ideas common to all technical experts. These, he says, have all observed that nature works in no arbitrary manner, but by fixed laws; that if these laws could be brought into right relation with us, we might be able to gear our small machines to the vast wheel of nature; that in the study of the laws of nature there is certainly revealed more of the infinite possibilities of our environment. In order to study to advantage, workers in pure and applied science must get into line with psychological laws, when it will be found that the apprehension of a fact by the mind requires the exercise of the power of observation, and the observations must be of a special character, minute, accurate, and selective. Observation, he says, means to see with attention, and as soon as concentration takes place, a process of analysis begins and the worker passes to classification and generalisation. Throughout this process the training of the hand stimulates the brain centres. Technology has a two-fold nature; first, learning by specialised study how to understand and apply the principles of mechanics to the construction of works of utility, and, secondly, training the mind to work easily along lines of scientific thought. The idea of utility, he maintains, seems to be the key to the distinction between pure science and technology; indeed, technology may be called the child of science on one hand, and of industrial progress on the other.

SOCIETIES AND ACADEMIES.

London.

Royal Society, March 16.—"On the Occurrence of Certain Ciliated Infusoria within the Eggs of a Rotifer, considered from the Point of View of Heterogenesis." By H. Charlton **Bastian,** M.A., M.D., F.R.S.

The weight of preconceptions against the possibility of the occurrence of heterogenesis has hitherto been so strong as to have made it almost impossible to obtain any adequate consideration for the actual evidence adduced in favour of this or that alleged instance. But of late, preconceptions in the domain of physics and chemistry have received severe shocks, and when we are told that a so-called "element" is daily being transformed and another is actually originating therefrom, there appears more chance of attention being paid to the alleged existence of phenomena in the organic world which would seem to be but the carrying on into a higher platform of the familiar but important phenomena known as allotropism and isomerism.

Hitherto, alleged instances of heterogenesis have, without adequate consideration of evidence, been almost always assumed to be results of "infection," but the writer claims that in the cases with which the present memoir is concerned, any such explanation is quite impossible in regard to one of the cases, at least, in which we have masses of living matter so large that they average $\frac{1}{8}$ mm. in diameter, being converted in the course of three days into great ciliated Infusoria of equal bulk.

The communication (which is illustrated by a large number of photomicrographs) deals with two sets of heterogenetic transformations occurring in the great eggs or "gemmæ" of one of the largest of the rotifers, namely, (1) the transformation of the entire contents of a Hydatina egg into a single great Otostoma; and (2) the segmentation of the Hydatina egg into twelve to twenty spherical masses, and the development of these sometimes into embryo Vorticellæ and sometimes into embryo Oxytrichæ.

(1) *The Transformation of the Entire Contents of a Hydatina Egg into a Great Otostoma.*—Having witnessed on very many occasions the stages of this remarkable transformation of the contents of a rotifer's egg into a ciliated infusorium, the author is desirous of acquainting the Royal Society with the simple procedure needful to enable zoologists to study for themselves the series of changes leading to a result which many of them may be disposed to deem incredible.

All that is necessary is to procure a good stock of these large rotifers by placing some surface mud, having a coating of Euglenæ, from a ditch in which Hydatinæ are known to exist, into a glass bowl, and to pour thereon water to a depth of about 4 inches. In the course of two or three days (with a temperature of 16° C. or 17° C.), if the Hydatinæ are abundant, a good crop of their large eggs will be seen at the surface of the fluid, where it is in contact with the glass.

By the aid of a scalpel passed along their track for a short distance, groups of twenty or thirty eggs may be taken up at one time, and gently pressed off the edge of the blade into a small, white stone pot full of water. Some of such small masses of eggs (mixed, perhaps, with a few Euglenæ) will float, and others will sink. After seven or eight of these masses have been gathered and deposited, the cover should be placed upon the pot so as to cut off from the eggs all light rays, both visible and invisible. Two other pots should be similarly charged.

When the pots have remained covered for thirty-six hours, one of them may be opened, and some of the small masses of eggs from the bottom of the pot should be taken up with a tiny pipette and placed in a drop of water on a microscope slip.

On examination by a low power it will be seen that there are many empty egg-cases, that within some eggs there are embryo Hydatinæ in different stages of development, while within the remaining eggs the contents will be wholly different, consisting of an aggregate of minute pellucid vesicles, each containing a few granules, together with a variable amount of granules interspersed among the vesicles.